

TO "GOLDEN" QUESTIONS

M ABBOTT NOV 15, 1989

1stuart  
Password?

Welcome to Telenet's GSFCMAIL service!  
GSFCMAIL is registered in the U.S. Patent and Trademark Office  
Copyright Telenet 1980-1988

Your last access was Monday, Nov 13, 1989 8:23 AM EST  
Today is Monday, Nov 13, 1989 3:04 PM EST

\*\*\*\*\* ATTENTION \*\*\*\*\* ATTENTION \*\*\*\*\* ATTENTION \*\*\*\*\*

READ THIS!

Beginning Saturday, November 18, X.400 will replace interconnect. Users who send inter-system messages (eg., to NASAMAIL) should read ALL messages from CUST.SVC in the GSFCMAIL bulletin board for information.

\*\*\*\*\* ATTENTION \*\*\*\*\*

CHECK these bulletin boards:  
GSFCMAIL

No. Lines	Delivered	From	Subject
1	Nov 9 11:25	MABBOTT	MODIS comments
37			
2	Nov 9 18:03	H.GORDON/OMNET	MODIS-N
63			
3	Nov 10 14:04	H.GORDON/OMNET	MODIS Accuracy Estimates
55			

Command? read

Posted: Thu Nov 9, 1989 11:25 AM EST  
From: MABBOTT  
To: LStuart  
CC: WBarnes  
Subj: MODIS comments

Msg: OJIJ-1622-3568

- 1) The five key science questions look fine to me. They hit the major areas of study.
- 2) There are some changes in the CES relationships.
  - a) Under Climate and Hydrologic systems, MODIS will make essential contributions in estimating air/sea flux of energy through SST measurements. This should be emphasized.
  - b) Under Biogeochemical Dynamics, MODIS will make essential contributions to Biosphere/Atmosphere/Ocean Fluxes of Trace Species. Specifically, it will allow synoptic estimates of primary production in the ocean which is crucial for understanding carbon dioxide uptake by the ocean.
  - c) Under Ecological Systems and Dynamics, MODIS will make essential

contributions to Long-Term Measurements of Structure/Function. In particular, the long time series of phytoplankton biomass and primary production may be one of the most important legacies of MODIS. In the area of Physical/Biological Interactions, MODIS will also provide essential information for comparisons of biological patterns (both terrestrial and oceanic) with physical forcing. This cannot be done with any other sensor. Finally, I would upgrade the contribution to Models of Interactions,

Feedbacks,

and Responses to Essential. MODIS will provide crucial data for developing and testing such models.

d) I would delete the reference under Earth Systems History.

- 3) Under Core Products, change the chlorophyll fluorescence to  $\pm 30\%$ . This may be optimistic, but for most conditions, we should be able to do this well in the basic fluorescence measurement. I think the higher errors referred to estimating pigment and production from fluorescence; these two products are in the special category.

That's all for now.

Action? purge

Purged.

Action?

Posted: Thu Nov 9, 1989 6:03 PM EST

From: [H.GORDON/OMNET] MAIL/USA

To: BGuenther/gsfcmail, JBarker/gsfcmail, LSTUART/gsfcmail,  
PSlater/gsfcmail,  
VSalomonsen/gsfcmail, WBarnes/gsfcmail,  
[H.GORDON/OMNET] MAIL/USA, [K.CARDER/OMNET] MAIL/USA,  
[M.ABBOTT/OMNET] MAIL/USA, [O.BROWN/OMNET] MAIL/USA,  
[R.EVANS/OMNET] MAIL/USA, [W.ESAIAS/OMNET] MAIL/USA

Subj: MODIS-N

H.R. Gordon's Comments Re the latest MODIS-N C/D

### Table 3.3.3 IFOV's and Spectral Band Characteristics:

I am a little concerned about the change in the 750 nm band to 745 nm. From some old figures I have there is a water vapor absorption band that seems to extend from about 715 nm to 740 nm. If the 745 nm band shifts at all to shorter wavelengths it will shift into the water band. There is also an Oxygen band that starts at 759 nm and extends to about 770 nm. If the band is at 750 nm it can shift by +/- 4 nm without getting into the water or the Oxygen bands. If it moves into the Oxygen band,

we should be able to correct for the Oxygen absorption; however, if it moves into the water vapor band I do not know if we will have enough information to perform a correction for the water absorption. Although I expect this has been looked at in detail by others already, I would be happier if Mike King would look at some better spectra of water vapor and see if the 750 nm to 745 nm shift is as much of a problem as I think it might be. I must point out that this band is VERY important to ocean studies since it will be the key band for atmospheric correction. I would hate to see an error here slip through the cracks at this late date.

#### Table 3.3.4.1 Modis-N VIS, NIR, SWIR Bands:

I still believe that the required SNR's be specified at MORE than one value of Ltypical.

#### Table 3.4.5.2 Absolute Radiometric Accuracy Requirements:

What happened to the "GOAL" column in this table? Although I don't support high accuracy calibration as a REQUIREMENT, I think it is a bad idea to leave the GOAL out. We all know that ocean color requires very high radiometric accuracy, so why not indicate this up-front and specify goals.

\*\*\*\*\*

The next two questions refer to the ability to maintain (and demonstrate) the desired stability of the instrument. This is critical; however, I can only ask the questions.

#### Section 3.4.9.1 In-Flight Radiometric Calibration:

In this section the statement "... shall be made with sufficient accuracy to assure that the calibration requirements delineated in this specification ..." is included. Does this mean that the accuracy in Table 3.4.5.2 is the required accuracy?

#### Section 3.4.9.3 In-Flight Reflectance Calibration:

In this section the statement "... shall be adequate, when combined with other on-board calibrations, to maintain the calibration and stability requirements ..." is included. Is this good enough, i.e., can we insure +/- 2% stability over 5 years (3.4.7.2) using radiometric procedures that are accurate to 5% (Table 3.4.5.2)?

\*\*\*\*\*

Action? purge

Purged.

Action?

Posted: Fri Nov 10, 1989 2:04 PM EST                      Msg: IGIJ-4090-8243/08  
From: [H.GORDON/OMNET] MAIL/USA  
To: BGuenther/gsfcmail, JBarker/gsfcmail, LSTUART/gsfcmail,  
PSlater/gsfcmail,  
VSalomonson/gsfcmail, WBarnes/gsfcmail,  
[H.GORDON/OMNET] MAIL/USA, [K.CARDER/OMNET] MAIL/USA,  
[M.ABBOTT/OMNET] MAIL/USA, [O.BROWN/OMNET] MAIL/USA,  
[R.EVANS/OMNET] MAIL/USA, [W.ESAIAS/OMNET] MAIL/USA  
Subj: MODIS Accuracy Estimates

In reference to the table specifying the accuracies of various products (in the package that was sent to the Modis Team) and in the interest of accuracy, I have a few comments concerning the ocean data products.

C. Water Leaving Radiance: Under good conditions, relatively clear atmosphere, nearby clear water pixels on which to base the atmospheric correction and at pigment concentrations of  $\sim 0.5 \text{ mg/m}^3$  or less, we achieved an accuracy of  $\pm 10\%$  with CZCS; however, in the general situation the error is larger. Thus, for CZCS an accuracy of  $\pm 10\%$  under OPTIMUM conditions was demonstrated. For MODIS (and SeaWiFS) the addition of the bands at 745 and 865 nm removes restrictions that were present with CZCS, i.e., no clear water areas are required, etc. My goal for MODIS and SeaWiFS (and I expect to be able to achieve it) is an accuracy of  $\pm 10\%$  (or perhaps some what better) under TYPICAL conditions when the pigment concentrations is  $\sim 0.5 \text{ mg/m}^3$  or less. Thus the real improvement is from  $\pm 10\%$  under OPTIMUM conditions to  $\pm 10\%$  under TYPICAL conditions.

D. Chlorophyll-a Fluorescence: I don't know where this number came from or what it means. Is it the error in the water-leaving radiance resulting from fluorescence? Is it the error in something derived from fluorescence? If the fluorescence is weak, say at a chlorophyll concentration of  $0.1 \text{ mg/m}^3$ , the error in the measurement of the fluorescence radiance may be very much larger than that given, and at high concentrations it might be less.

E. Chlorophyll-a Pigment Concentration: The comments I made in reference to water-leaving radiance (C) above apply equally well here. The key is replacing OPTIMUM conditions with TYPICAL conditions. In fact the error in the pigment concentration algorithm for in Case 1 waters using SHIP data is  $\sim \pm 20\%$  so the accuracy in the table is approximately that which we think is possible from ships, i.e., it implies a PERFECT atmospheric correction and NO sensor noise.

G. Detached Coccolith Concentration: I don't know where an accuracy of  $\pm 35\%$  came from. We have not made a good assessment yet; however, the accuracy becomes better the higher the concentration of coccoliths. I have no real objection to the 35% figure, I just don't really know what it should be.

I. Attenuation at 490 nm: Same comment here as for (C) and (E).

L. Angstrom Exponent: I don't have a number that I can go to the wall for, but based on the CZCS experience, I expect +/- 15% is reasonable for the exponent between 745 and 865 nm for TYPICAL scenes over the ocean. The more turbid the atmosphere, the higher the accuracy. Conversely, for very clear atmospheres the error will be larger.

M. Single Scattering Aerosol Radiance: This was never determined routinely for CZCS; however, we expect to start with the existing data base in the near future. What was determined for CZCS was the actual aerosol radiance at 670 nm. An accuracy of +/- 10% is reasonable at this wavelength for Case 1 waters with pigments < about 0.5-1. mg/m<sup>3</sup>.

Action? purge

Purged.

Action?

Command? check gsfcmail

Now using bulletin board.

Command? scan

Bulletin Board contains:

No. Delivered From  
Lines

Subject

1 Nov 10 14:11 CUST.SVC  
206

NICKNAMES is here !!!

2 Nov 8 16:15 WMACOUGHTRY

Urgent  
"MANIFEST" Bulletin Board

3 Nov 9 13:04 ANECRI

post office closed

4 Nov 13 8:13 REMARTIN

MISSING EQUIPMENT -- HP-8780A DE

5 Nov 13 11:57 FGORDON

SMM STATUS

Command? read

Posted: Fri Nov 10, 1989 2:11 PM EST

Msg: PJIS-1622-4531

From: CUST.SVC

To: GSFMAIL (URG)

CC:

Subj: NICKNAMES is here !!!

USE OF NICKNAMES

A HUETE

December 4, 1989 @ 9:00 (Monday - regular pick up)  
December 15, 1989 @ 9:00 Friday  
December 29, 1989 @ 9:00 Friday

Please note that except for December 4, time cards will be picked up early for the balance of the calendar year. I will continue to send a reminder on telemail and put notices in Dateline Goddard.

Thanks,

Gale

Action? purge

Purged.

Action?

Posted: Tue Nov 14, 1989 12:50 PM EST

Msg: HJIJ-1622-6941

From: AHUETE

To: LSTUART

CC: VSALOMONSON, CJUSTICE

Subj: COMMENTS TO MODIS SPECS AND PRODUCTS AND GLOBAL CHANGE

Attachment #1. "Fundamental Questions in Earth Science to be addressed by MODIS:

In my opinion the terrestrial component (item 2) seems rather short considering considering MODIS will be the major driver for global change studies over land surfaces. The following are some additions for your consideration:

- "... MODIS will provide improved estimates of the areal extent", seasonal dynamics, and community composition of major terrestrial biomes.

- MODIS will play an integral role in monitoring hidrologic processes and fluxes within the major biome types. Improved estimates of soil moisture storage (and storage capacities) and evapotranspiration will become available.

- MODIS will play a key role in biogeochemical cycling of Carbon and Nitrogen through analysis/ monitoring of vegetative growth, senescence, and decomposition processes within the major biome types.

- MODIS will help in studies of the influence of albedo changes on surface surface heating/cooling and associated regional climates, particularly with respect to tendencies toward aridity.

-MODIS will help in quantifying the factors controlling the spatial distribution and biomass of plant communities (topographic, geologic, climatic, and eda , and edaphic factors).





# CHRIS JUSTICE

1  
**From:Chris Justice**  
**To:Locke Stuart/ Vince Salomonson.**

**Comments on the Salomonson Package (deadline Nov 15)**

NB. Direct addition to the document is provided in italics. Other additions should be made as suggested in the memo. I see that a further iteration is required once all the comments have been included. However a fast turn around can be expected on the second iteration as it will be a case of agreement or disagreement.

## **1. The Team Member Letter.**

Apologies for sounding as if the needle has stuck but: I dont think the ' 5 Questions/Areas ' is the way to define the problem of identifying EOS science objectives and to prioritise the payload. It is one of the problems that we have had all along, namely 'we have designed an instrument what can we do with it?' A better approach would be to define the specific science questions and design the instrument combination to provide the data to address the question. Identifying individual instrument capabilities in isolation runs contrary to the concept of an integrated system with different sensors working synergistically. Similarly if the synergism issue is not addressed at this time, instruments needed together may be on different platforms. In spite of my strong feelings on this issue I have made some changes to the MODIS 5 below.

## **2.The 5 Fundamental Questions.(Suggested alterations).**

Point 2.....Modis will provide *improved* estimates of the areal spatial extent of major biomes, *their internal characteristics and seasonal variability*. Modis will also provide *regional monitoring* of spatial changes in land cover and land use with particular emphasis on forest alteration, *agricultural expansion and land degradation*. Information *derived* from Modis.

Point 3..... I believe that this point should be adjusted as

follows move from the general to the specific: *Modis will provide global data sets of surface temperature and albedo which will be used to provide improved data for modelling the energy balance of the planet.* Particular emphasis will be placed on providing improved estimates of the spatial extent of snow and ice cover along with its temporal variation. Additionally.....

### **3. Figure 11.**

My reading of the Document indicates that MODIS will play the following additional roles:

Biogeochemical Dynamics:

*Biotic fluxes of trace gases ( Essential)*

*Terrestrial inputs to marine systems (Contributing)*

Human Interactions:

*Population growth and distribution (Contributing)*

Solid Earth Processes :

*Surficial processes (Contributing)*

### **4. Comments to support CES priorities chart.**

#### Climate and Hydrologic Systems

Para 1. Solar reflectance and thermal emission was not a strong statement in the 5 MODIS silver bullets. This reinforces my suggestion for Point 3 above.

Para 4. Same point as in Para 1.

#### Biogeochemical Dynamics

Para 1. Add .....*from MODIS in an improved form. Improved indices will be developed as part of the MODIS program, incorporating the reflectance contribution from soil and surface litter components of the scene.*

Para 2. These ISLSCP interaction studies are planned for 1992 and it is unclear that by MODIS launch there will be a continued program. . For example there is no return to FIFE will there be a return to SIFE ?

A new para should be added to include direct measurement of fires by MODIS giving much improved trace gas emission estimates from tropical biomass burning.

A new para should be added to include MODIS capability for monitoring active fronts of deforestation and the use of HIRIS data (high spatial) in conjunction with MODIS (high temporal / moderate spatial) to give the necessary multi-level data for monitoring tropical deforestation components.

### Ecological Systems

Para 1. I do not agree with this sentence and would certainly change it. On page 56 there is no statement that VI data MUST be combined with HIRIS to make a fundamental contribution. Modis alone will make a fundamental contribution however, High spatial resolution data will help in certain areas of high spatial variability to improve our understanding of the Modis sensor response. Same applies for SAR .?

Essential and contributing roles of MODIS were not marked for the following categories on Fig 11.

### Human Interaction

*Estimating Population growth and distribution can be greatly assisted by knowledge concerning shifting patterns of land-use, agricultural expansion, deforestation particularly in areas where information is absent or questionable. Modis could provide such knowledge on land use population distribution which will contribute to the sampling program to provide improved estimates of population distribution.*

### Solid Earth Processes

*Modis will contribute to the study of surficial processes for*

*example by providing information with which to determine run-off characteristics, sedimentation and erosion at the regional and watershed scale.*

## **5.TABLE OF MODIS PRODUCTS AND ACCURACIES.**

I am not clear how these estimates were obtained for accuracy and would like to do this at the next meeting and have the author present how the calculations were done. The +/- .1 for NDVI is clearly wrong. What is the 6th Science Question?

## **6. The SPEC**

From the MODIS meeting last week it is my understanding that it is too late to iterate changes with the team. I hope we have caught most of the points. We should minimise future changes but need the mechanism to make changes if absolutely necessary to the Science Objective.

7. I am reading the CORE product document and will comment when I can. The next meeting should be the time that this is done in detail. All members should come to the meeting with detailed comments on the document.

DR. YORAM J. KAUFMAN  
code 613, NASA/Goddard SFC  
Greenbelt, MD 20771  
FAX (301) 286-4804

YORAM  
KAUFMAN

November 6, 1989  
Work Tel. (301) 286-4866  
Home Tel. (301) 989-0773  
BITNET ZWYJK @ VPFVM

## Modis water vapor and fire channels

### 1. Water vapor in cloud free atmosphere

A sensitivity study is being conducted for the optimization of MODIS bands 18 and 20. Though the study was not finished as yet, present results show that there should be an advantage making the following changes:

channel #	old wavelengths (nm)		new wavelengths (nm)	
	center	bandwidth	center	bandwidth
18	908	35	905	30
20	950	20	940	50

The present setting generates 2 channels, one with medium water absorption (18) and second with strong water absorption (20), in addition to band 19 that has maximal water vapor absorption in the near IR. The remote sensing procedure will be based (as presently conceived) on ratio of 2 channels, a non-absorbing channel (band 2) and an absorbing channel (band 18, 19 or 20). In most cases of remote sensing of water vapor in cloud free atmosphere the ratio of band 2 to band 20 will be used. For very dry conditions the ratio of band 2 to band 19 will be used, and for very wet conditions the ratio of band 2 to band 18 will be used. The provision of 3 water vapor channels with substantially different absorption strength, will also provide the opportunity for correlation methods to be developed, in a similar line to the methods proposed for HIRIS. The wider channel 20 will make it less sensitive to uncertainties in the spectral band.

### 2. Detection of fires

Since the 2.06 channel was canceled and it was not found useful to generate a new cloud channel, it is proposed to form a special fire channel. As a result the 2.06 channel is proposed to move to  $3.75\mu\text{m}$  with width of 50 nm. The channel should not saturate under  $700^\circ\text{K}$  and have a step of at most  $5^\circ\text{K}$ .

DR. LOCKE STUART  
DR. MIKE KING

MODIS

## PROPOSED REVISIONS TO THE MODIS DOCUMENT

### A. Fundamental questions in Earth Science to be addressed by MODIS:

#### In 3.:

1. The current text is: ....cloud properties including cloud type, temperature, altitude, cloud optical thickness,.....

The suggested text should be (additions are **bold**): ....cloud properties including cloud type, **reflectance**, temperature, altitude, **size distribution**, cloud optical thickness,.....

**EXPLANATION:** Cloud area and perimeter, or in short "size distribution is one of the MODIS products. It is important in understanding cloud dynamics, and its relation to perturbations such as pollution and global warming. Cloud reflectance in the visible spectrum is used to derive the optical thickness, and so in a way it is not an independent parameter. But since it is directly related to climate, through the reflection of sun light, and since there are still problems in comparison between the optical thickness derived from the measured reflectance, and ground truth, I feel that it should be monitored independently, in order to reveal effects of pollution and climate change on cloud radiative interaction through its reflectance.

2. The word *improved* appears twice (third line from the bottom).

#### In 5.:

3. The current text is: ....e.g. volcanic activity, aeolean transport, and sea salt)....Measurements of fire size and land cover when.....

The suggested text should be (additions are **bold**): ....e.g. volcanic activity, aeolean transport, **desert dust transport** and sea salt)....Measurements of fire size and **temperature**, and land cover when.....

**EXPLANATION:** Desert dust is a major aerosol phenomenon and should be explicitly mentioned, mainly if MODIS emphasize is on semi-dry and desert areas. Fire temperature is very important since for different temperatures of the burning, a different mixture of the trace gases is released. By the way I did not found the word *aeolean* in a dictionary.

#### In Fig. 11:

4. It is suggested to add \* or \*\* to "Bio/Atm/Ocean fluxes of Trace Species".

**EXPLANATION:** Remote sensing of biomass burning that I understand belongs in this category, is responsible for emission of trace gases from the biosphere to the atmosphere. Due to deforestation in South America, and due to increasing rate of savanna burning in Africa and other

areas, the input of trace gases to the atmosphere is a growing problem. Except the CO monitoring suggested EOS instrument, MODIS is the only sensor that can be used to monitor fires and an emitted product - aerosol that through the fire temperature is related to the emission of other trace substances.

5. It is suggested to add \* to "Volcanic Processes".

**EXPLANATION:** MODIS can monitor the surface temperature, that can be an early warning of volcanic activity. It can also monitor dust or sulfur aerosol generated in the volcanic activity. These can be used to detect volcanic activity that had happened but was not discovered before, as well as to estimate the magnitude and the characteristics of the activity, and its effect on the atmosphere.

## **ROUGH DRAFT SUPPORT COMMENTS FOR CES...**

6. In "Climate and Hydrological Systems":

In the end of the first paragraph it is suggested to add: ***MODIS also monitors water vapor and aerosol particles that interact to form clouds, and therefore determine the cloud characteristics (see CES high priority research need (i) page 35).***

7. IN Biogeochemical dynamics

At the end of this section I think that a short paragraph on biomass burning, related to deforestation and agricultural practices, should be added, since it is one of the main pathways of the interaction between vegetation and the atmospheric chemistry. Recently there is also strong indication of the effect of savanna burning on acid deposition in Africa. Their importance is mentioned in CES:

p. 42 - acid rain and deforestation.

p. 50 in high priority research needs - "The development of improved trace gas and particulate emission inventories.....such as fossil fuel energy policies and land-use patterns"

The following may be an example of the paragraph:

MODIS, through remote sensing of aerosol emission, fire frequency, size and temperature, will improve the trace gases and particulate emission inventories (CES p. 50) by monitoring biomass burning in tropical forests and savanna regions, as well as aerosol concentrations in industrial regions.

8. In Human interactions

estimatiing --> estimating

urganization --?--> urbanization

### Table of "Preliminary estimates of MODIS core data product...

In I.A. change  $\pm 10\%$  to  $0.2\mu\text{m}$  for the present day and  $0.1\mu\text{m}$  fro MODIS

IN. I.H. change  $\pm 15\%$  to  $\pm 5\%$

### **Table 3.3.3**

Band 7 do not delete, but change to 3750 center band, 428 m IFOV 50 nm bandwidth.

DR. YORAM J. KAUFMAN  
Code 613 NASA/Goddard SFC  
Greenbelt, MD 20771  
Fax (301) 286-4804

November 6, 1989  
Work Tel. (301) 286-4866  
Home Tel. (301) 989-0773  
Bitnet: ZWYJK @ VPFVM

Band 18 change to 905 center band, 30 nm bandwidth (see attached letter for explanation).  
Band 20 change to 940 center band, 50 nm bandwidth (see attached letter for explanation).

### Table 3.3.4.1

Same changes as in table 3.3.3 for the center wavelengths. For the new band 7 the requirements are as for the old 21h channel, except that the typical scene temp is 400°K.

*Please let me know that you  
got this material.*

*Thanks*

*Yoram x 4866*

M KING

M D King

Fundamental Questions in Earth Science to be addressed by MODIS:

modis  
15 Nov 19  
JW

1. Through global observations of ocean color, solar-stimulated fluorescence and thermal emission MODIS will provide greatly improved estimates of phytoplankton biomass, oceanic photosynthetic potential, and sea surface temperature. These will provide improved understanding of the magnitude and variability of oceanic primary production (and the ability of the oceans to sequester carbon), ocean physical variability (related to ocean and ocean-atmosphere heat and mass flux), and the coupling between ocean biological and physical phenomena. MODIS data will lead to better understanding of the transformation of inorganic carbon into organic forms and their eventual burial in deep marine sediments (a key process of the carbon cycle), and the planetary heat and moisture cycles, and how variations in these cycles are affected by, and in turn affect global climate change. MODIS will provide oceanic observations important for addressing oceanic components of global biogeochemical cycles, the hydrologic cycle, and the energy budget of the Earth.

2. Through the acquisition of daily and global observations at spatial resolutions of 214-856 meters, MODIS will provide improved estimates of the areal extent of major terrestrial biomes. MODIS will assist in the estimation of photosynthetic potential, biomass, evapotranspiration and net primary productivity within these biomes and will monitor their phenology and changes in state. MODIS will also monitor spatial changes in land cover and land use with particular emphasis on forest alteration and land degradation in semi-arid environments. Information on the nature and rates of change, including those brought about through anthropogenic activities, will be used to understand their contribution to regional and global climate change.

Size distribution

3. Through daily and global, relatively high spatial resolution (214-856 m.), and long-term measurements of cloud properties including cloud type, ~~temperature~~, altitude, <sup>reflectance</sup> cloud optical thickness, thermodynamic phase and effective particle radius, MODIS will provide information leading to a better understanding of the effects of clouds on the radiation budget of the Earth and the role of clouds in the so-called greenhouse warming of the Earth including associated feedback mechanisms associated with the dynamics of the atmosphere. Additionally, these observations will provide ~~improved~~ improved estimates of surface-incident photosynthetically active solar radiation for use in studies of oceanic and terrestrial primary productivity on a global scale.

4. MODIS will provide estimates of the spatial extent of global snow and ice cover along with its temporal variation. Additionally, through measurements of snow and ice extent along with concurrent observations of surface temperature, outgoing longwave radiation, cloud cover and bidirectional reflectance obtained from MODIS, better understanding of the dynamics of snow and ice melt processes over large (greater than several thousands of square kilometers, for example) watersheds, continents and the globe will be derived with subsequent better quantification of the role of these processes in the hydrological cycle.

5. Through observations of marine and continental aerosol properties on a global basis, MODIS will provide information as to the spatial and temporal variability of aerosols and their relationship to sources and sinks associated with natural phenomena (e.g. volcanic activity, aeolean transport, <sup>desert dust transport</sup> and sea salt) and anthropogenic activity (e.g., biomass and fossil fuel burning). <sup>and temperature</sup> Measurement of fire size and land cover when combined with ground and airborne measurements will provide regional and global estimates of trace gas emissions from biomass burning. The interaction between aerosols and water vapor will also be studied in the context of cloud evolution.

M. KING

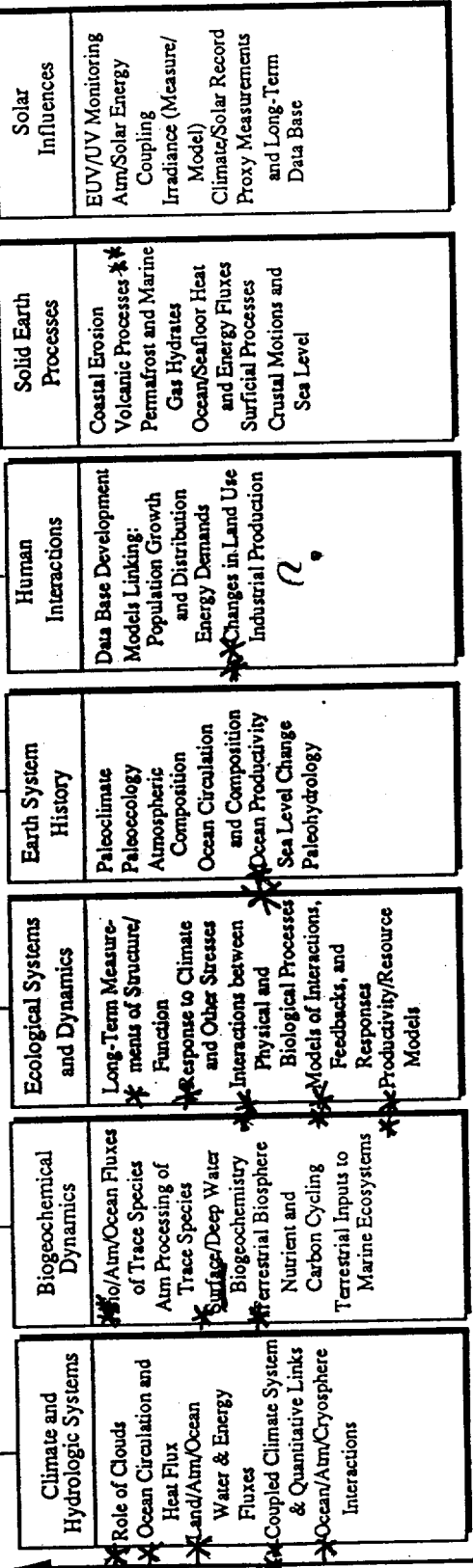
### STRATEGIC PRIORITIES

- Support Broad U.S. and International Scientific Effort
- Identify Natural and Human-Induced Changes
- Focus on Interactions and Interdisciplinary Science
- Share Financial Burden, Use the Best Resources, and Encourage Full Participation

### INTEGRATING PRIORITIES

- Documentation of Earth System Change
  - Observational Programs
  - Data Management Systems
- Focused Studies on Controlling Processes and Improved Understanding
- Integrated Conceptual and Predictive Models

### SCIENCE PRIORITIES



Increasing Priority

Figure 11. U.S. Global Change Research Program Priority Framework

\* Essential  
 \*\* Contributing

3 D K. 3

M. KING

11/1/89

ROUGH DRAFT SUPPORT COMMENTS FOR CES PRIORITIES CHART (11/1/89)  
(comments solicited from team members. The total writeup cannot exceed two pages. The  
CES document is being provided for your reference)

### Climate and Hydrologic Systems

MODIS makes essential and strong contributions in this whole general area. In essence MODIS makes contributions through its observations of cloud properties over the globe with relatively high spatial resolution, the extent of the major terrestrial and marine biomes plus the extent of snow and ice. Furthermore it observes state variables such as solar reflectance and thermal emission that relate to radiative processes occurring at the ocean/atmosphere and land/atmosphere interfaces.

+ the global distribution of the  
MODIS makes an essential contribution to the study of clouds through a determination of the cloud optical thickness, effective particle radius, cloud top altitude, thermodynamic phase and area extent. <sup>at a resolution of 4 km or better on a daily basis</sup>  
combinations of selected channels in the visible, near, short and long-wave infrared coupled with the 214-856 m spatial resolution and daily coverage.  
The observations of ocean color and thermal emission including sea surface temperature contribute to synoptic, large area observations of the patterns of flow dynamics along with providing information pertaining to the latent and sensible heat flux at the ocean atmosphere boundary.

Similarly over land MODIS will monitor the extent (large regions, continental and hemispheric) of hydrologically significant land covers such as vegetation, snow and ice, cloudiness as well as the bi-directional reflectance and surface temperature leading to estimates of key components of the surface radiation balance within various land cover categories. MODIS-T, in combination with MISR, will help to better understand how to make better estimates of albedo using bi-directional reflectance observations.

Kaufman's comment

### Biogeochemical Dynamics

The CES document on page 44 clearly refers to the strengths of current observational programs being derived from ocean color remote sensing such as that derived from CZCS and, in the future SeaWiFS. The vegetation index derived from the present AVHRR is also noted. Each of these, of course will be available produced from MODIS, but with improved accuracy and improved sampling.

rewrite

On page 47/CES there is a discussion of Boreal Forest-Atmosphere interaction studies that should be pursued as envisioned for ISLSCP. Here MODIS will contribute

- will to understanding biogeochemical dynamics chlorophyll concentration  
In this area MODIS contributes through its provision of ocean color, sea surface temperature, ocean flows visualization and the mapping of the extent of terrestrial biomes. These then lead to estimates of terrestrial and marine ecosystems productivity. <sup>biotic productivity of</sup>

Kaufman >

### Ecological Systems and Dynamics

will a  
The MODIS provides largely contributory information in this general area based on the CES document. On page 56 the vegetation index information is cited but this must be combined with high spatial resolution data such as that from HIRIS and SAR in order to make remote sensing have a fundamental contribution. The contribution from MODIS will come from contributing to the extension of the multi-

for to make  
and targeted measurements from MODIS-T and MISR AS

year data record compiled by the AVHRR on the operational meteorological satellites. The provision of the ocean color and sea surface temperature from MODIS provides an essential element in these studies for mapping ocean primary producer resources. The greater spectral information provided by MODIS relative to AVHRR or CZCS/SeaWiFS should help in elucidating ecosystem properties.

### Earth System History

The long time scales in this general category do not suggest that MODIS <sup>or any other EOS sensor</sup> will ~~make~~ be able to any significant contributions ~~in this particular~~ except as they are derived in activities that fall under the previous research areas discussed above.

### Human Interactions

- MODIS <sup>9</sup> makes a strong contribution in this area by offering a direct approach to estimating the total extent of various land use practices associated with anthropogenic activities. Among these are such things as deforestation, extent of agricultural practices, urbanization, etc. The MODIS estimates must be refined through the use of high spatial resolution data to depict the fine detail and processes occurring at the boundaries and where there may be mixtures of land use within MODIS pixels. As noted in the MODIS questions, MODIS will be most applicable in areas with lesser cloudiness e.g., semi-arid and arid areas. MODIS will provide data to help validate models.
- 

### Solid Earth Processes

MODIS will contribute to this area through mapping the extent of permafrost and large glaciers or ice sheets. It will also serve a role as an early detection mechanism for volcanic eruptions in remote areas (i.e., the high temperature bands on MODIS-N are there, at least in part, to provide this capability).

### Solar Influences

MODIS makes only very minor, if any, contributions in this area.

{ MODIS will also make it possible to study variations in vegetation arising from <sup>human-made</sup> (Amazon forest burning, grazing in arid regions) and natural (Sahelian drought) stresses on ecological systems.

# J. PARSLow

To: LSTUART  
Subj: IWG Input

Locke:

Herewith my response to the IWG input.

1. The fundamental questions and priority framework seem ok.
2. The support comments seem a little general and vague. I've written a couple of paragraphs for the Biogeochemical Dynamics, and Ecological Systems and Dynamics sections. I don't expect you to adopt them verbatim of course, but you may find the odd phrase or idea useful.

## Biogeochemical Dynamics.

The CES document (P44) refers to the remote sensing of ocean color from CZCS and vegetation index from NOAA as current observational strengths. In fact, there is no current ocean color satellite, and observation in the early 1990's depends on the launch of SEAWIFS. MODIS will allow much improved estimates of ocean color, and other important parameters such as attenuation coefficients, dissolved organics, etc, especially in shelf areas which are important sites of carbon burial in sediment. MODIS will also allow mapping of terrestrial biomes, and their structural and functional properties, at improved spatial resolution.

The estimation of fluxes, as opposed to standing stocks, is essential to biogeochemical dynamics. MODIS will permit improved estimates of marine and terrestrial production, by providing measurements of physiological indicators, such as chlorophyll fluorescence in the oceans, and driving variables such as surface illumination and surface temperature. MODIS estimates of aerosols may also be significant, given current theories of limitation of marine primary production by aeolian trace metals.

## Ecological Systems and Dynamics.

The CES document suggests three components to this area: characterization, measurement and monitoring; research on ecological processes; development of predictive models. MODIS allows global monitoring of terrestrial and marine ecosystems at coarse spatial but fine temporal resolution. It provides frequent estimates of coarse biomass measures such as ocean color and NDVI, and more specific information such as coccolith or blue-green algal abundance in the oceans. MODIS also contributes to research on ecological processes by providing data on physical driving variables (solar illumination, temperature, cloud cover) on short time scales. Ecological processes cover a large range of space and time scales, and MODIS fills an important slot in this spectrum.

3. The Table of products and accuracies bothers me. It may be acceptable as a rough guide to product accuracy, but I'm not sure it would stand rigorous scrutiny. It would of course require a very large, detailed and exhaustive study to back these estimates. The MODIS CORE DATA PRODUCT AND ALGORITHM REPORT mentions estimated accuracies in some but not all cases, but does not attempt to rigorously examine these estimates. Some general comments: The use of percentage errors is in many cases misleading as the percentage error depends on the signal strength (eg water leaving radiance and chlorophyll fluorescence).

In some cases (eg chlorophyll and attenuation algorithms), the database

supporting empirical formulae is still limited, and it is unclear that errors found in a relatively small number of local ground-truth experiments can be applied to routine processing of global data. Reporting R-squared values is not very useful in my opinion, especially in cases (eg primary productivity) where log-log regressions are involved.

More specifically, with regard to the ocean data products:

a. I doubt that water-leaving radiance is currently estimated from CZCS to within 10%. In some cases, this requires that the atmospheric signal (Rayleigh plus aerosol) be calculated and removed with 1% accuracy, and I don't think we can do this for CZCS. The 7% figure may be reasonable for "typical" but not for low (eg high chlorophyll blue) water-leaving radiances for MODIS.

b. Again, I suspect that the percentage error in chlorophyll fluorescence will range from low at high chlorophyll to enormous at chlorophyll values less than 0.5 mg/m<sup>3</sup>.

c. I think product E should be explicitly CASE-I Waters Chlorophyll. While the 35% accuracy is often quoted for CZCS chlorophyll, it is not clear that this applies to scenes processed "at random" by automated algorithms. I do not know the basis for projecting a 50% accuracy for CASE-II chlorophyll estimates from MODIS.

d. Product I (attenuation at 490 nm) surely applies to CASE I waters. I doubt there is much point in including the R-squared value.

e. In the case of product K (primary productivity), the R-squared value means little. If one uses log-log regressions of productivity on surface chlorophyll, the scatter about the regression line spans an order of magnitude. Thus, an error of about 300% seems appropriate. I don't think we can give a realistic estimate of the accuracy which will be attained with MODIS.

Hope this helps....John Parslow.

Action? purge

Purged.

Action?

Command? bye

This mail session is now complete.

PAD: CALL CLEARED - REMOTE DTE ORIGINATED Diag code: 20 hex  
j"%M=99Q%9I-5M]%Q!5)

# SRUNNING

LSTUART  
Password?

Welcome to Telenet's GSFCMAIL service!  
GSFCMAIL is registered in the U.S. Patent and Trademark Office.  
Copyright Telenet 1980-1988

Your last access was Tuesday, Nov 14, 1989 4:15 PM EST  
Today is Wednesday, Nov 15, 1989 2:02 PM EST

\*\*\*\*\* ATTENTION \*\*\*\*\* ATTENTION \*\*\*\*\* ATTENTION \*\*\*\*\*

READ THIS!

Beginning Saturday, November 18, X.400 will replace interconnect. Users who send inter-system messages (eg., to NASAMAIL) should read ALL messages from CUST.SVC in the GSFCMAIL bulletin board for information.

\*\*\*\*\* ATTENTION \*\*\*\*\*

CHECK these bulletin boards:  
GSFCMAIL

No. Lines	Delivered	From	Subject
103	1 Nov 14 16:20	SRUNNING	MODIS comments
13	2 Nov 14 16:34	LSTUART	UPN 692 SHORTFALL
53	3 Nov 14 19:11	POSTMAN/NASA	[From: <wan%crseo@hub.ucsb.edu>]
106	4 Nov 15 8:27	VSALOMONSON	STEVE RUNNING INPUT

Command? READ

Posted: Tue Nov 14, 1989 4:20 PM EST      Msg: AJIJ-1622-7272  
From: SRUNNING  
To: lstuart  
CC: vsalomonson  
Subj: MODIS comments

Locke, here are some comments on the MODIS packet

COMMENTS BY STEVE RUNNING AND RAY HUNT, UNIV OF MONTANA  
15 NOV 1989

Fundamental Questions in Earth Science to be addressed by MODIS

We find the current discussion for terrestrial ecosystems seriously flawed. Mapping areal extent and changes of biomes is not the most innovative thing that MODIS will do, it is something Landsat can do now!! We should emphasize the repetitive coverage and global scale. More specifically, the text does not emphasize the daily

coverage of MODIS that allows seasonal tracking of vegetation activity and the comparison of that activity world wide. Also, the discussion of uses for terrestrial surface temperatures for following vegetation growing seasons and stresses is non-existent. Finally, in terrestrial ecosystems the most important current logic is the use of sensors like MODIS to drive complex ecosystem simulation models, which then can provide computations of "invisible processes" such as photosynthesis and evapotranspiration. This fundamental characteristic of MODIS is never mentioned at all, which we consider disastrous.

We propose the following text as replacement for question 2.

2. Daily acquisition of global MODIS data at spatial resolutions of 214-856 meters will provide estimates of terrestrial leaf area index, absorbed photosynthetically active radiation, surface temperatures and vegetation stress. These direct MODIS products will then be used as inputs to complex biome simulation models, calculating important terrestrial processes such as photosynthesis, evapotranspiration, net primary productivity, and nutrient cycling, which cannot be directly measured by satellites. Weekly compositing of MODIS data and simulations will then allow monitoring effects of climatic perturbations such as drought and human perturbations such as air pollution on growing seasons, and estimating global variability by all biome types. Over annual time scales, areal coverage of global biome types can be mapped, and spatial changes in land cover and land use monitored. Final MODIS products will elucidate the role of terrestrial vegetation in global biogeochemical cycling and feedbacks to climate change.

Support comments for CES Priorities chart.

We propose the following text:

#### Climate and Hydrologic Systems

ADD: MODIS will be used to parameterize global biosphere dynamics into the GCM models for exploring feedbacks between terrestrial conditions and climatic responses.

#### REPLACE:

##### Biogeochemical Dynamics

The highest priority in the CES in biogeochemistry is the estimation of global fluxes of carbon between the atmosphere, land and oceans. Subsequent priorities are to understand the role of the terrestrial biosphere in regulating the global carbon and nutrient cycles.

MODIS data on leaf area index, absorbed photosynthetically active radiation, surface temperatures and vegetation stress will contribute directly to this priority by determining global carbon fluxes from photosynthesis, respiration and decomposition for all terrestrial biomes using complex simulation models.

MODIS will be the only sensor with the high temporal/spatial resolutions necessary to follow terrestrial-aquatic transport of materials.

#### Ecological Systems and Dynamics

The highest priorities of this CES section are to monitor long term changes in vegetation in response to natural and human induced perturbations, increased CO2, climate change, physical/chemical stresses, and their interactions.

MODIS contributes directly to these priorities by daily, global estimation of key terrestrial variables such as leaf area index, APAR, surface temperatures and vegetation stress.

At annual time scales MODIS is the only sensor that will document changes in global land use/land cover that will influence agro-forestry resource models.

MODIS data will be the preferred input source for complex global biome simulation models, predicting interactions and feedback responses of terrestrial biomes to climatic and other global changes.

#### FOR PRIORITY FRAMEWORK:

MODIS should be labeled essential for the 'bio/atm/ocean fluxes' and 'terrestrial inputs to marine systems' under Biogeochemical Dynamics.

MODIS should be labeled as "essential" priority for all of the Ecological Systems and Dynamics studies.

Let me know if you have questions!!

Steve Running

Action? PURGE

Purged.

Action?

Posted: Tue Nov 14, 1989 4:34 PM EST  
From: LSTUART  
To: [REMURPHY/NSA] NASAMAIL/USA  
Subj: UPN 692 SHORTFALL

Msg: HJ-1622-7305

NO, BOB; THERE'S NOT ENOUGH 677 FY '89 LEFTOVERS TO COVER THE UPN '92 FIVE SHORTFALL. CURRENTLY THERE'S ONLY \$127K AVAILABLE. \$300K OF APPROVAL WAS GRANTED TO MACKENZIE FOR EOS. THE REMAINING \$127K WILL BE USED TO COVER FY '90 UPN 677 REQUIREMENTS

Alan Strahler

AS

stuart  
assword?

Welcome to Telenet's GSFCMAIL service!  
GSFCMAIL is registered in the U.S. Patent and Trademark Office.  
Copyright Telenet 1980-1988

Your last access was Wednesday, Nov 15, 1989 12:02 PM EST  
Today is Thursday, Nov 16, 1989 8:16 AM EST

\*\*\*\*\* ATTENTION \*\*\*\*\* ATTENTION \*\*\*\*\* ATTENTION \*\*\*\*\*

READ THIS!

Beginning Saturday, November 18, X.400 will replace interconnect. Users who send inter-system messages (eg., to NASAMAIL) should read ALL messages from CUST.SVC in the GSFCMAIL bulletin board for information.

\*\*\*\*\* ATTENTION \*\*\*\*\*

No.	Delivered	From	Subject	Lines
1	Nov 15 16:16	INTERMAIL/USCISI	Nov. 15 Response	70
2	Nov 15 16:29	SLSMITH	Separation of the	26
3	Nov 15 16:39	MLADOMIRAK	CODE 280 PEER AWARDS	11
4	Nov 15 17:40	POSTMAN/NASA	From: <@RELAY.CS.NET:alan%bucrs	75
5	Nov 15 17:46	INTERMAIL/USCISI	Nov. 15 Response	70

Command? r

Posted: Wed, Nov 15, 1989 4:16 PM EST  
From: [INTERMAIL/USCISI] TELEMAIL/USA  
To: LSTUART/GSFCMAIL  
Subj: Nov. 15 Response

Msg: IGIJ-8939-6070/00

Received: from BU-IT.BU.EDU by INTERMAIL.ISI.EDU id aa08768; 15 Nov 89 8:10 PST  
Received: from DOC.BU.EDU by bu-it.BU.EDU (5.58/4.7)  
id AA27634; Wed, 15 Nov 89 12:08:30 EST

Return-Path: <alan%bucrsb.bu.edu>

Received: by doc.bu.edu (4.1/4.7)

id AA18524; Wed, 15 Nov 89 12:07:33 GMT

Date: Wed, 15 Nov 89 12:07:33 GMT

From: alan%bucrsb.BU.EDU@bu-it.bu.edu

Message-Id: 8911151707.AA18524@doc.bu.edu

To: [LSTUART/GSFCMAIL]GSE2/USA%TELEMAIL@intermail.isi.edu,  
lstuart%gsfcmail.nasa.gov@RELAY.CS.NET

Subject: Nov. 15 Response

I received by express mail the package of materials requiring comment by November 15. In general, I have no problems with the items. I have two suggestions, documented below.

I suggest the following minor change in Fundamental Question 2:

2. Through the acquisition...within these biomes and will monitor their  
vegetation structure, <-- text added here  
phenology and changes in state.....

Rationale: MODIS-T should allow us to examine vegetation structure  
remotely, which will be most useful in determining surface roughness,  
albedo, standing biomass as well as characterizing vegetation BRDF's.

I also suggest a double star on the "Long-Term Measurements..." item of  
the "Ecological Systems and Dynamics" box in the priority framework  
diagram. Again, MODIS-T through BRDF measurements should provide  
vegetation structure data that is relevant to strengths (v), (ix), and  
(x); and to weaknesses i(b), (iii), (iii)(b) (pp. 56-58, CES Report).

I suggest the following addition to the working of the "Ecological Systems  
and Dynamics" paragraph of the rough draft support comments:

"The MODIS provides...such as that from HIRIS and SAR  
and angular measurements from MODIS-T and MISR <-- text added  
in order to make remote sensing have a fundamental contribution...."

Alan Strahler

To reply to me on internet, you can use the following procedure:

When on a Telemail system, one can send mail to us by the following  
mechanism. This is a bit bogus in that the address is part of the  
message.

The 'compose' command in Telemail will cause the prompts 'To:', 'CC:',  
'SUBJ:', and 'TEXT:'.  
Here are the responses:

TO: [INTERMAIL/USCISI] TELEMAL/USA  
CC: <whatever>  
SUBJ: <whatever>  
TEXT:

Now type the text of the message. The first two lines MUST be the  
following, and the third line must be blank. The actual message starts  
on the fourth line.

1. Forward: ARPA
2. To: alan%buersb@bu-itt.bu.edu
3. <blank>
4. first line of message

Action? purge

Purged.

# D. TANRE

Contact admin/arc (Li

Received: Mon, 13 Nov 89 13:44:43 -0800 (5.57/1.2)  
Received: from ltpsun.GSFC.NASA.GOV by ames.arc.nasa.gov (5.61/1.2); Mon,  
13 Nov 89 13:44:43 -0800  
Received: Sat, 11 Nov 89 01:45:46 EST by ltpsun.gsfc.nasa.gov (4.0/1.5)  
Date: Sat, 11 Nov 89 01:45:46 EST  
From: didier tanre <didier@ltpsun.gsfc.nasa.gov>  
Message-Id: <8911110645.AA01737@ltpsun.gsfc.nasa.gov>  
To: lstuart@gsfcmail.nasa.gov  
Subject: MODIS

1. Fundamental questions : no comments
2. Priority Framework  
may be add a contribution to "terrestrial inputs to marine ecosystems"  
Modis will provide info of aerosols and their relationship to  
sources and sinks, aeolian transport of saharan dust and deposition  
processes for example.
3. Support comments  
in section biogeochemical dynamics, add sources and sinks of  
atmospheric  
particles associated with natural phenomena and anthropogenic activity
4. Products and accuracies  
May be too early to specify, algorithms are not completely defined,  
checked and validated.  
For the atmosphere core data, the retrieved products and their  
accuracies  
will depend on the surface conditions, ocean or land.  
Minor comments:  
The single scattering aerosol albedo appears in I (atmosphere core  
data)  
and in III( ocean core data), with a different accuracy.  
The angstrom exponent in part III has to be defined, related to  
aerosol  
optical thickness or to aerosol reflectance?
5. Specifications  
In table 3.3.4.1, the max spectral radiance in band 9 has been  
decreased  
(175 to 150) in front of the previous spe. (/09/18/89) with no  
significant  
improvement of SNR. The previous one was better to study large  
aerosol  
event. Why this change?

D.TANRE

Action? purge

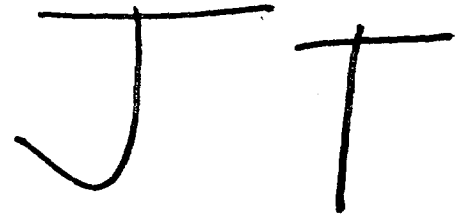
Purged

Action?

Posted: Mon Nov 13, 1989 5:42 PM EST  
From: JPARSLOW

Msg: NJIJ-1622-6141

# John Townshend



To: Locke Stuart  
From: John Townshend

Subject: Input for EOS IWG/SEC Facilities Panel with respect to MODIS.

Having discussed the document with COJ a number of additional points arose which he suggested I should communicate directly to you.

**Figure 11 and accompanying text.**

I do not understand why MODIS is only seen as 'contributing' to many topics under Ecological Systems and Dynamics. This may link with the rather down beat comments under this section-heading on the following page.

MODIS is NOT simply an extension of the AVHRR. Its much better spatial resolution globally (428/214 m versus 4 kms), additional bands, better radiometric properties etc etc all mean that it will provide essential inputs to all the areas where it currently has a double star (contributing), and it is surely going to 'contribute' (at least) to long term measurements of structure and function.

Moreover MODIS will undoubtedly provide an 'essential' input to the study of changes in Land Use (under 'human interactions'). HIRIS will also be important but its data will not be available with sufficient frequency on a global basis for this task.

The comments under the heading 'human interactions' with reference to semi-arid areas and cloudiness is unhelpful: the problems of cloudiness refer to every optical sensor and it is the high 'temporal resolution' of MODIS which makes it such a key sensor for more cloudy areas.

**Pointing knowledge(section 3.4.6.1.)**

I do not know what this spec translates to in terms of inter-image registration. The only point I would emphasize in the strongest possible way is the need to obtain sub-pixel registration accuracy in the standard products given to the user, given the vital role of MODIS in detecting and monitoring *change*. The lower our pointing knowledge, the higher the burden in achieving high registration accuracy on the ground.

Z WAN

WHAT WE'LL DO IS USE FY '90 UPN 692 MONEY TO COVER THE FIFE FY '89  
SHORTFALL. WHAT'S IMPORTANT IS THAT 692 BE FUNDED WITH ADDITIONAL  
FY '90 MONEY TO COVER THE FY '89 SHORTFALL.

INCIDENTALLY, FIFE NEEDS CONSIDERABLE "UP FRONT" MONEY TO KEEP  
BODY AND SOUL TOGETHER--ABOUT \$1.3M.

LOCKE STUART

Action? PURGE

Purged.

Action?

Posted: Tue Nov 14, 1989 7:10 PM EST  
From: [POSTMAN/NASA] NASAMAIL/USA  
To: lstuart@gsfcmail  
Subj: [From: <wan@crseo@hub.ucsb.edu>] comments

Msg: RJIJ-2847-7547/23

Internet mail from the Ames NASAmail Gateway follows:  
Send the following line as the first line of the text of your reply:  
To: <wan@crseo@hub.ucsb.edu>  
Contact admin/arc (Lilly Compton) for details.

Received: Tue, 14 Nov 89 15:50:30 PST by gemini.arc.nasa.gov (5.57/1.2)  
Received: from crseo.ucsb.edu  
by hub.ucsb.edu (4.1/UCSB-v2)  
id AA04227; Tue, 14 Nov 89 15:50:25 PST  
Received: by crseo.ucsb.edu (4.0/SMI-4.0)  
id AA25462; Tue, 14 Nov 89 15:49:26 PST  
Date: Tue, 14 Nov 89 15:49:26 PST  
From: wan@crseo@hub.ucsb.edu (Zhengming Wan)  
Message-id: <8911142349.AA25462@crseo.ucsb.edu>  
To: lstuart@gsfcmail.nasa.gov  
Subject: comments

Hi, Mr. Locke M. Stuart:

I just mailed my comments to Dr. Salomonson in Federal Express.  
I thought it should be delivered over night, but they say that  
it be granteed to be delivered before Nov. 16 3 pm.  
Therefore I report the main points here.

Comments on Support Comments for CES Priorities Chart

Human Interactions

change 'urorganization' to 'urbanization'

Comments on Products and Accuracies

## II.B. Surface Temperature

### Present-day:

- + - 3 degree C from limited in situ evaluation,
- + - 6 degree C from general simulation

### MODIS-era:

- + - 1 degree C for known surfaces,
- + - 2 degree C in general

I also update the land surface temperature part in the MODIS Core Data Product and Algorithm Report. I will present detail in the next MODIS Science Team Meeting.

Zhengming

Action? PURGE

Purged.

Action?

Posted: Wed Nov 15, 1989 8:24 AM EST  
From: VSALOMONSON  
To: CJUSTICE  
CC: LSTUART  
Subj: STEVE RUNNING INPUT

Msg: IJLJ-1622-7826

CHRIS//WHAT FOLLOWS ARE SOME MORE AMBITIOUS STATEMENTS ABOUT THE ROLE OF MODIS IN THE TERRESTRIAL BIOSPHERE. PLEASE LOOK THEM OVER AND SEE IF YOU AGREE THAT THESE CAN BE SUCCESSFULLY DEFENDED. THANKS //VINCE S.

Forwarded message:

Posted: Tue Nov 14, 1989 4:20 PM EST  
From: SRUNNING  
To: Lstuart  
CC: vsalomonson  
Subj: MODIS comments

Msg: AJIJ-1622-7272

Locke, here are some comments on the MODIS packet

COMMENTS BY STEVE RUNNING AND RAY HUNT, UNIV OF MONTANA  
15 NOV 1989

Fundamental Questions in Earth Science to be addressed by MODIS

We find the current discussion for terrestrial ecosystems seriously flawed. Mapping areal extent and changes of biomes is not the most